NASA Performance-based Contracting Initiative

A Guide for Development of the Project Surveillance Plan

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FOREWORD

This guide provides a starting point for the creation of a project-specific Performance Surveillance Plan. It inlcudes a sample structure and instructions for the development of a plan that demonstrates NASA's specific approach to *insight focused* **monitoring of contractor performance during the execution of the contracted effort. This guide illustrates how to create a surveillance plan to complement and extend the features of a performance-based contract beyond providing incentives for the contractor's schedule and cost performance. In addition, a sample generic surveillance plan is included for the purpose of illustration. In creating the surveillance plan, NASA Project Managers define a framework that describes how they will conduct their ongoing surveillance programs, identifies the critical surveillance activities and metrics, and provides an organization and associated resources to execute the plan.**

This guide has been structured to allow the creation of a project plan that is probably different from every other plan written in the past. The guide starts with the premise that the contractor has the innate ability to execute the job without considerable Government oversight. Because of this premise, NASA surveillance programs will not require oversight to be as intense or as frequent once the product quality is considered to be acceptable. The reality of NASA's reduced manpower pool reinforces this view, requiring careful designation of a strategy and reinforcement by an appropriate designation of surveillance activities and metrics in a lean surveillance organization. However, this viewpoint requires a fresh approach, an approach that is in many ways illustrated in the included sample Project Surveillance Plan.

The sample plan shows how confidence can be gained and feelings of uncertainty can be reduced while minimizing the overall risk that the job will not be accomplished or will be performed poorly. This sample plan illustrates an approach based on emphasizing total project risk reduction through a pareto assessment of critical issues. In this approach, lessons learned, prior experience, and formal risk analysis are used to identify the most significant issues and to establish sound, outcome-focused monitoring practices to reduce or mitigate project risk. Other activities are established such that the Project Manager is continuously provided future-oriented insights to allow preventive measures to be taken to reduce overall risk. It also illustrates the use of metrics control limits by which one establishes *a priori* **acceptable windows of performance and identifies recommended management response if contractor or project management performance falls outside the window.**

The plan creation process and the overall surveillance process require a team-based approach. The team must maintain a focus that emphasizes assuring project success while mirroring the management style of the Project Manager and his organization. When the process of creation is completed, the resulting plan will be the guide for all surveillance program activities. Since it is a living plan, changes to metrics, processes, control limits, and other detail-related items should be anticipated and built in to the project management process.

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A GUIDE FOR DEVELOPMENT OF THE PROJECT SURVEILLANCE PLAN

1.0 Introduction

The commitment of the NASA Administrator to implement a performance-based contracting initiative requires a shift in the way that NASA conducts significant portions of its stated mission. Performance-based contracting is based on the premise that good performance by a contractor can and should be encouraged by the use of direct monetary incentives. The earing of incentives is based on the objective rating of the contractor's performance using evaluation criteria that are fully understood and agreed upon. In anticipation of earning greater profits, contractors are motivated to perform at a higher level and deliver superior performance at lower costs to the agency. Furthermore, performance-based contracting is focused on results rather than process; the Government states *what* it needs - the contractor takes on the responsibility for determining *how* the stated objectives will be accomplished.

In support of the strategy of using performance-based contracting, the reality of shrinking budgets, and the need to "streamline its workforce and supporting infrastructure," NASA has also announced an intent to reduce its level of contractor oversight, instead focusing on activities leading to "insight" of contractor performance. The agency believes that by selecting a firm that provides "best value" with proven past performance and providing positive incentives for good performance, the insight-based approach to contractor surveillance will reduce administrative and surveillance costs. A significant part of orchestrating this approach is the development and implementation of a Project Surveillance Plan.

2.0 Purpose of a Project Surveillance Plan

The Project Surveillance Plan (PSP) describes the way that a Project Manager and the related project organization plans to conduct "insight-focused" surveillance of a contracted effort (i.e., it defines the Surveillance Program). The plan's purpose is to define the surveillance strategy, activities, and metrics that the Project Manager will use to manage the contracted effort effectively. The Project Surveillance Plan, if implemented conscientiously, reduces project risk by focusing surveillance activities on contract performance areas with the greatest potential to disrupt or prevent successful

completion of the program. From NASA's point of view, it reduces the sense of uncertainty and unease that may come from turning over formerly Government-supervised functions. It is a good business practice because it lays out in clear terms what NASA will do to assure success, what it will conduct surveillance on, what the yardsticks for acceptable performance are, and what the agency will do should performance not meet goals. In addition, the plan defines the organizational responsibilities and resources dedicated to executing surveillance. The Project Surveillance Plan is created by NASA, preferably in concert with the contractor, and may feed into the Project Manager's Performance Incentive program. The Project Surveillance Plan complements the Project Management Plan, the ??? Plan, and the ???? Plan by providing specific underlying direction and defining significant elements of the project execution strategy. *The Project Surveillance Plan defines the project surveillance program***.**

The Surveillance Plan adds value to the management of the project by providing a ready means to focus scarce resources on items that truly affect the outcome of the product. In simplest terms, the surveillance plan must define what is really important to the success of the program. In his book, *In Search of Excellence***, Tom Peters noted that the things that get measured are the things that tend to have the most psychic importance to the leaders of an organization and, consequently, are the things that get done. The Project Surveillance Plan allows the Project Manager to quickly set the project agenda by defining the selection of measurable items (metrics) that define success. Not only do metrics show the status of the project and its critical components, but they can become a method of managing. If metrics include a required performance level (control limits), it is possible to institute a** *management by exception* **policy, in which management attention is brought to bear only when performance (or performance trend) is outside predefined limits. It may also be helpful to define specifically what forms of management action will be taken when a metric drops outside the control limit. Workers and managers alike will know up front what is being measured, what performance is expected, what resources are available to work issues, and what happens if performance is not within acceptable limits.**

The structure of the Project Surveillance Plan should fit the structure of the project being monitored. Programs that have inherently low risk, low dollar value, and little political importance require a far simpler surveillance plan (and Surveillance Program) than many efforts ongoing within the agency. In the next section, a basic

outline of the plan is provided as an initial starting point, acompanied by a brief explanation of what should be included in each section and why.

3.0 Plan Outline

A sample surveillance plan outline is shown in Figure 1 as a general guideline for consideration. The actual order of the activities, metrics, and organization sections is clearly left to the discretion of the planning team; however, all of these topics must be captured in some detail in this document. The plan itself must be thorough enough to direct surveillance activities, providing the reader a fairly comprehensive view of the project and its objectives and how surveillance will be employed to reduce risk and monitor contractor progress in completing contracted efforts. The sections following the generic PSP outline in Figure 1 describe in summary form the expected contents of each major section.

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2.0 Surveillance Program Objectives

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- 6.3 Response to Performance Outside of Control Limits

7.0 Project Surveillance Organization and Required Resources
- 7.1 Organization
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Figure 1. Sample Surveillance Plan Outline

The following section provides bulleted comments on the general contents of each the areas and the expected types of information needed to be obtained and tailored for the plan.

- **Introduction**
  - **Background**
    - **Identifies the following:**
      - **Project purpose and general objectives**
      - **Procurement approach**
      - **Selected contractor team and factors leading to team selection**
  - **Project Introduction**
    - **Summarizes details of the contract plan**
      - **Summary of prime contractor requirements**
      - **Contractor's detailed offer**
      - **Contract type and incentive program summary**
      - **Contractor's proposed schedule**

- **Surveillance Program Objectives**
  - **Expresses expected outcomes of contractor surveillance**
  - **Tangible/intangible benefits**
    - **Quantifiable**
    - **Measurable**

- **Applicable Documents**
  - **All applicable directives, policy statements, handbooks; may include the following:[1]**
    - **Insight Implementation Plan (IIP) (DRAFT), March 14, 1996**
    - **Subject Effort Statement of Work**
    - **Subject Effort Request for Proposal/Request for Quotation**
    - **Subject Effort Proposal/Technical Assignment/Task Order/Contract**

- **Surveillance Strategy and Approach**
  - **In simplest terms, describes what NASA will do to reduce project risk while assuring successful completion of the contract**

[1] NASA Handbook NHB 2340.4a, June 1994 (Rescinded) may be used for historical reference

- **Sample Strategies:**
  - **Execute significant oversight of QA process during definition and staff training**
  - **Conduct frequent workplace safety inspection during startup, with random checks only after X months**
  - **Conduct random oversight of material inspection procedures**
  - **Allow normal variations of metrics within control limits; implement oversight review if outside control limits for more than X days**
  - **Execute independent IV&V of software products**
  - **Monitor hardware QA program through informal interface**
- **Approach may describe the technical basis for performance monitoring**
  - **Independent activities**
  - **Use of contractor's metric data base**
  - **Non-destructive testing**

- **Project Surveillance Activities and Schedule**
  - **Activities**
    - **Identify NASA surveillance actions, tying them into the strategy**
    - **Scope and scale should be consistent with "insight"**
  - **Sample types of surveillance activities**
    - **IPR participation**
    - **Design Review**
    - **Process Action Team participation**
    - **Flight Readiness Review**
    - **Project manager integrated assessment of performance**
    - **Random material and process inspection monitoring**
  - **Schedule provides integrated top-level view of contractor's project and planned surveillance activities (recommend placing in an appendix)**
    - **Recommend using a graphic format that shows the following:**
      - **Top-level WBS and critical path**
      - **Relative scope of effort (cost) of each WBS element**
      - **Duration of element activity**
    - **Use of both Gantt and network work flow charts can provide a clear graphic representation of the program**

- **Project Surveillance Metrics and Control Limits**
  - **Metrics section - Identifies the following:**
    - **What will be measured**
    - **How it will be measured**
    - **Why it will be measured**
    - **What the acceptable limits (control limits) are**
    - **What happens when a measure falls outside limits**
  - **Selecting meaningful metrics**
    - **Should align with desired outcomes (objectives)**
    - **Expresses efficiency of processes**
    - **Measures should be intuitive and easy to grasp**
    - **Helps to identify adverse trends when taken over time**
    - **Must be a consistent measure of the same thing each time**
    - **A few good metrics are better than many data displays**
    - **Execution of insight requires proactive, future-looking metrics**
  - **Establishing control limits**
    - **If there is sufficient data, statistical approach (2 sigma limits) may be used**
    - **As experience builds, plan to change the performance limits to reflect learning curve related improvements**
    - **If possible, relate to SOW performance requirements**
    - **Specify why the lower limit indicates unsatisfactory performance**
  - **Identifying what will be done by management in response to unsatisfactory performance**
    - **Should also identify what will be done with continued satisfactory performance**

- **Project Surveillance Organization and Required Resources**
  - **Surveillance organization**
    - **Must be explicitly identified**
    - **Responsibility and authority assigned**
    - **Smaller is better**
    - **May also include independent contractors, prime QA staff, and OGA**
  - **Resources identify the financial commitment to the surveillance activity and staff**
  - **Describes any specific needs in terms of in-plant office space or specialized ADP system**

4.0 Creating the Surveillance Plan

Project Surveillance Plans do not just happen. Creating a good plan takes time and the effort of a group of people that themselves have a vested interest in the outcome of the program. It is not just another bureaucratic exercise meant to gather dust on the shelf after it is written. The plan identifies how the Project Manager will monitor the progress of the contractor team in executing the program. Creating the PSP does not mean dusting off a previous project plan (or calling a buddy who had to do one three years ago and asking for a copy of his). Project surveillance plans define the activities, processes, products, and outputs that NASA will monitor to assure that the agency receives the quality goods and services for which it pays. The decisions made early in the project towards the surveillance activities will likely set the tenor for future progress.

If the plan displays a proactive bent towards resolving issues before they become major crises, then the entire project will be more likely succeed. If the plan is focused only on recording what has happened, there will be little opportunity to change the direction of the project when things do go wrong. Proper selection of metrics and surveillance activities, focused primarily on taking a proactive leadership role in monitoring the contractor (and the program) to encourage success, will pay off in the long run by avoiding extensive cost overruns, missed opportunities, and embarrassing failures. In most cases, NASA and the selected contractor already have a very good idea of what issues, technologies, and processes have the greatest potential for adverse effects. By planning to concentrate heavily (80 percent of the effort) on these opportunities (20 percent of the total number of possible issues), the potential for success increases.

Creating the plan requires deliberate action and careful thought and analysis. A team of 8-10 individuals, each with commitments to the success of the program, taken from both the government and the contractor (fewer for a small program, more for a larger program), must be involved to assure a balance and agency-wide support. The Project Manager is responsible for articulating an overall project strategy and for providing specific guidance to the team in the formulation of the Project Surveillance Plan. The team's selection of metrics and surveillance activities must be based on informed decisions, requiring past performance data and issue analysis. As a screening criteria, the team must determine how surveillance will contribute to mission success or key performance attainment. All surveillance activities and metrics should show direct impact on reducing project risk. (If they do not, reconsider them!) Selection of a limited scope of key surveillance activities can reduce cost while reducing project risk. The

careful assembly of information will help in the identification of potential risk-inducing issues and subsequent selection of issue-related and general project surveillance metrics.

4.1 Forming the Project Surveillance Plan Authoring Team

The selection of the PSP authoring team is a key step in the establishment of a solid plan. If the team takes its work seriously and is enabled to define an "insight" focused surveillance plan, then significant savings for the project can be realized. Individuals on the team should be provided the assurance that their effort can lead to improved execution of agency activities and that their work will enable the agency to continue its essential missions even in times of financial austerity. Individuals selected for the team should have a firm insight into the life-cycle processes of the specific project and be cognizant of the ongoing performance-based contracting initiatives. In addition, the team must be fully informed of the details of the contract vehicle, with deep insight into all performance incentives being offered, the proposed methods of evaluating performance for incentive award, and any offered warranty conditions. The team must be given a firm charter by the Project Manager, provided a definitive suspense for completion, have an appointed leader, and have the dedicated resources required to publish the plan. Ideally, the team would assemble for a set period of time at a location apart from their normal working location with completion of the plan as the condition for returning to their "normal" life. If possible, no intrusions from their home station should be allowed. In short, this team should function with the same intensity as a Source Selection Board until an acceptable plan is produced. At the completion of the plan, depending on the nature of the project and Project Manager, the plan may go out for optional staffing or be coordinated through the team members. The Project Manager alone will be the approving authority for the surveillance plan.

4.2 Timing

Ideally, development of the Project Surveillance Plan should follow an iterative approach. Beginning with the creation of an initial draft document in concert with the project Statement of Work, the plan is revised to reflect contractor response to the RFP and the final negotiated settlement. As the NASA project management/contractor relationship gels, and the project demonstrates necessary levels of performance, some modifications to the plan should be anticipated. However, at the beginning of work, a

fully formed surveillance plan identifying strategy, activities, metrics, and control limits will be in place.

4.3 Assembling Information

The PSP authoring team has the charter of gathering as much relevant data concerning the performance of the task as is possible and assembling it into a cogent plan for conducting surveillance. Interviewing senior staff; forming cooperative working groups with industry and government; gathering reports, records, and results; and independently reviewing industry "best practices" data bases may all be applied to obtain a core of critical information. Some information may be directive in nature or may be extracted from policy statements. Much of the best information may be anecdotal; however, data bases of prior project information may be available for use. In any case, the selection of specific activities, metrics, and control limits will be best served by documented evidence leading toward the selection and identification of a method of application. The key to subsequent issue identification is a methodical categorization and explanation of apparent issues and potential risks to project success. Selection of similar or predecessor programs in the information quest provides an opportunity for identification of technical problems, whereas agency prior experience with the contractor organization may yield insights into "traditional" contractor management difficulties.

4.4 Identifying Risk-based Issues

Ideally, bid evaluation included a risk analysis assessment of the competing offerors programs. If the evaluation did include this assessment, then this risk assessment should be imported as a basis for identifying critical issues. When possible, reduce this list of critical issues to those with direct and immediate impact on the program. Eliminate those issues from consideration that NASA has little or no means of impacting or that are outside the time span of the program.

Should there be no existing risk issues compilation, the team should create one. Preferably, the team should be able to assemble a draft list of risk issues from prior personal experience, from lessons-learned data bases, from related type programs, and from corporate team knowledge. It will be important for the team to examine the issues from a root cause perspective rather than from a symptomatic perspective. Processes, procedures, regulations, and "the way it's always been" are good starting points when

looking for causal factors. If possible, a pareto analysis to identify the few most important measures of potential for project success should be attempted.

4.5 Selecting Metrics

Metrics selection is critical to the development of insight-focused project monitoring and management. Ideally, the metrics set will be minimal in extent, use data that are already being collected for a similar purpose, and when displayed, provide management with a rapid, intuitive insight into the effectiveness and efficiency of the contractor's efforts in meeting contract objectives. If possible, a connection to the PBC incentive serves to reinforce and reward excellent performance and mission accomplishment. Metrics offer a static look into the processes of the contractor, providing a snapshot of the process at a single point of time. Displays of multiple points can provide the essential view of the dynamics of the process and can be used to interpret past performance and predict future performance. Two types of metrics are recommended: risk issue focused and general project focused. The issue metrics are by nature narrowly focused on the reduction of risk in a single area and specifically measure the progress in accomplishing that risk reduction. Conversely, the general metrics show the overall progress of the project in meeting its objectives. If possible, selected metrics should link point status to resource use and outcomes achieved rather than compare status to projected schedule charts. The comparison to schedule really measures only how well the job was forecast rather than how well it is meeting its objectives. Simple metrics, descriptive of essential processes and outcomes, are usually best because they can be quickly grasped by management.

Metrics also require some form of specification of acceptable performance, frequently identified as control limits. The theory is that if the outcome of surveillance and data analysis shows the project to be within static and dynamic bounds of performance, there should be little reason to provide any more than cursory attention. The resulting management by exception provides a powerful means of focusing essential management efforts on the truly critical issues of the program.

Over time, the mix of metrics and critical issues must be revisited, particularly if the management team is effective in resolving the high-risk elements of the program. Differing phases of the project life cycle require a modified mix of activities, usually shifting from the design and planning aspects to the deployment and performance verification elements as the project matures. As a metric is proposed, a good test to use

is as follows: "Does this metric really help me to reduce the risk to mission success or better understand the status of my program?" If it does not meet those conditions, it may be important only to a small, narrowly focused constituency for the purpose of justifying their existence within the organization.

EXAMPLE SURVEILLANCE PLAN FOR THE IO3 PROJECT

1.0 Introduction

The IO3 Project will place an unmanned orbital platform in prolonged low orbit around the Jovian moon Io for the purpose of scientific study of atmospheric and geophysical phenomenology of Io. Information obtained by this orbital platform's sensors will be transferred to NASA ground stations through the Tracking and Data Relay Satellite (TDRS) system to NASA ground stations. The objectives of this mission and supporting project include the following:

Clear concise statements of the project intent and operational goals make it easier to develop the surveillance strategy, activities, and metrics.

- Insert a 125 kg sensor platform that features radar mapping, multi-spectral imaging, and spectrographic instrumentation into a 350 km elliptical polar orbit around Io by March XXXX for a 48-month surveillance mission
- Fabricate a low-cost, high-capability, space-capable sensor system employing off-the-shelf military and adapted civil sensors, computer controls, and communications systems
- Demonstrate NASA capability to design, fabricate, flight qualify, and launch a low-cost sensor platform in 24 months from project approval
- Employ low-cost Delta launch vehicle to reach earth escape velocity and place platform into Io insertion trajectory
- Execute the fabrication and launch project within the budgeted $125 million resource pool

Call out any special objectives or goals that differentiate the project.

- **Reduce Government oversight and reporting requirements**

2.0 Background

The IO3 project builds on the success of the LUNA2 Project in which a lightweight, inexpensive proof-of-concept satellite platform was placed in low lunar orbit in a $125 million, 22-month project. In this project, ADL Aerospace created an orbital sensor platform using off-the-shelf adapted hardware, while NASA provided vehicle integration and launch services to achieve lunar orbit. This platform has been on station since November XXXX.

Establish a contractual background of prior successes/failures that led to this project, if possible.

NASA solicited industry replies to a Request for Proposal (RFP) and has evaluated responses to the RFP. The IO3 Project Manager, with the concurrence of the NASA Administrator, has awarded a contract to the AJX team to design, fabricate, flight prepare, and launch the IO3 platform by July XXXX.

Identify any awards that have been made and what, in general, the contractor will do.

NASA's approach to reaching the IO3 project objectives identified above relies on exploiting the extensive technical capabilities and experience of the prime contractor team in sensor platform design and fabrication, integration, and launch operations. NASA will provide the launch vehicle from on-hand inventory, supply launch facilities, and conduct mission surveillance, platform operation, and platform station-keeping operations. In addition, NASA will provide the additional Government Furnished Equipment (sensors and communications sets) identified by the prime contractor's proposal at the location and time requested. Refurbishment, retrofit, and verification of material operability are the responsibility of the prime team.

If Government participation is a significant factor in contractor success (i.e., GFE, joint workforce, schedule uncertainties), identify it here.

The AJX team, composed of ADL Aerospace as the prime contractor and subcontractors Stonewall Launch Services

and RBJD Integration Inc., were selected in a competitive bid project for a cost plus incentive fee (CPIF) contract. They were awarded the contract based on evaluation of best value to NASA, considering technical and cost risk, cost realism, management team qualifications, and past performance in similar projects. A strong consideration for selection was the unsolicited warranty offer by the AJX team. The team has posted a performance bond warranty that proposes to reimburse NASA *in toto* **should the IO3 platform not reach Earth escape velocity due to launcher material failure. The warranty also specifies that should the platform not achieve operational status on station due to platform failure (including internal software error), AJX will provide a replacement sensor platform. If on-station failure occurs, a sliding reimbursement scale has also been identified. However, this warranty does not provide consideration for "acts of God" or for error or negligence by NASA in the operation of the sensor.**

If you know why the contract was awarded to this contractor, identify the specific features that led to the Government's decision. Call out warranty considerations explicitly.

3.0 Project Introduction

The IO3 Project continues the transition of agency activities from its prior all-encompassing, broad-mission-area way of doing business in which NASA conceptualized the need, designed the approach, participated directly in the fabrication of the solution, and conducted all aspects of space operations. In the new environment, NASA activities will move away from the processes of designing the solution and participating directly in the fabrication and integration of the solution. In doing this, NASA anticipates significant cost savings, allowing the agency to focus on efficiently conducting the functions of basic scientific research, space exploration, and proof-of-concept experimentation as defined in the charter.

Identify special elements of the surveillance or management approach being taken in this project. Explain what the expectations of NASA management are in executing this approach.

This shift in focus requires the agency to move decisively into the role of a purchaser of hardware items and related services that meet mission objectives. In purchasing these services and goods, NASA's role is that of informed consumer, in which the agency monitors the outcomes of the provider and attempts to reduce the risk to the agency in procurements without imposing manpower-intensive oversight. The following paragraphs describe the specific required outcomes, provide details of the contract and incentive structure used by the Project Manager, summarize key features of the contractor's offer and technical and management approach, and provide a summarized milestone schedule of the IO3 project.

3.1 Summary of IO3 Prime Contractor Requirements

An electronic version of the request for proposal for the IO3 project is available on line in the NASA Code M on-line repository at HTTP:\\WWW.NASA.IO3.RFP. NASA has modified the paper format of the document by adding hypertext links through the table of contents and "hot buttons" to the original electronic format proposal document to aid in accessing key phrases or sections in the RFP. No password access is required. A downloadable version is provided at FTP:\\NASA.IO3.RFP.

Identify how a person can find the detailed SOW/RFP for review.

Key features of the IO3 RFP and award process included the following:

- **Sensible competitive range determination**
- **Performance and accomplishment-based objectives as requirements**
- **Rapid award cycle based on best value**
- **Open written question period with question and answers provided to all qualified competitors**

Summarize key or distinctive elements of the RFP to frame a context for this surveillance plan.

The RFP was solicited and awarded in a 132-day process that was completed on March XX, XXXX. Final negotiations are ongoing as this plan is being written.

Provide details of the process used to award the contract if they are relevant to the establishment of surveillance. Protests and recompetes are considered significant.

3.2 Contractor's Detailed Offer

An electronic version of the complete offer by the AJX Team is available in the NASA Code M on-line repository at HTTP:\\WWW.NASA.IO3.AJXPROP. Password access is required to view the document and is available through the NASA Code M webmaster (WEBMSTR@codem.nasa.gov) by sending an e-mail message requesting access. NASA has modified the document slightly by adding hypertext links and "hot buttons" to the original electronic format proposal document to aid in accessing key phrases or sections in the proposal. Modifications and addenda to the proposal will be posted periodically by Code M as negotiations are completed, and all IO3 project staff will be notified electronically of the changes.

Identify how the user can find the contractor's proposal and final negotiated contract. This is what will be executed.

Key features of the AJX proposal included the following:

- **Hardware/software Performance Warranty**
- **Open data access to AJX team project management task performance files**
- **Extensive prior experience**
- **Use of proven, low-cost flight hardware in proposed initial design**
- **COTS/GOTS radiation hardening verification using Aurora facility**
- **Reduced risk and cost realism to provide best value to NASA**

Summarize highlights of the contractor's proposal that might affect preparation of the surveillance plan.

3.3 Contract Type and Incentive Program Summary

NASA has awarded the AJX team a cost-plus-incentive-fee contract for six defined tasks for firm product or attainment deliverables for the design, fabrication, and launch services necessary to attain mission objectives within the 24-month project window. Two types of incentive fee award are possible: delivery and cost avoidance. Delivery incentive fees are awarded based on delivery of product on time with the requisite level of quality. Cost management fee is based on completion of the task below the estimated cost. The incentive pool is fixed for delivery and variable for cost management.

Delivery incentives provide fee for timely completion of assigned tasks. On-time delivery will be rewarded with a 90 percent of pool award. Early delivery will be awarded up to 100 percent. Late delivery will be awarded incentive if, and only if, product quality meets specified objectives. Incentive awards are made after the successful completion of the contact task. Table 1 shows the specific delivery fee award schedule.

By first describing the contract type and incentive, you can differentiate or identify commonality in the surveillance and incentive programs. Depending on the project, the incentive program may be included with the surveillance program.

If the details of the incentive program are known, a brief summary helps all to understand what constitutes successful performance for payment purposes.

TABLE 1. DELIVERY INCENTIVE FEE SCHEDULE

Time For Completion (Percent of Negotiated Time)	Quality of Deliverables	Delivery Incentive Pool Award
< 95 Percent	As Specified	100 Percent
96 Percent - 105 Percent	As Specified	90 Percent
106 Percent -115 Percent	As Specified	70 Percent
116 Percent - 130 Percent	As Specified	45 Percent
131 Percent - 150 Percent	As Specified	20 Percent
> 151 Percent	As Specified	5 Percent

Cost avoidance incentives provide an opportunity for the contractor to share in realized cost underruns. The cost management incentive award is based on cost avoidance in the execution of the task while meeting or exceeding deliverable performance and quality goals on time. The formula for cost avoidance incentive computation is simple: the contractor keeps 50 percent of the cost underrun if the deliverable products meet performance and quality goals and were delivered within 110 percent of the negotiated completion time. No other cost avoidance incentive is available.

3.4 Contractor's Proposed Schedule

This contract will be executed using six well-defined tasks with clearly defined deliverables and specific required deliverable performance. The method of verification of performance was established in the RFP and in the contractor's proposal. A summarized version of each of the contractor's six tasks are provided in Gantt chart format at Annex B of this surveillance plan. Each chart shows the level 2 WBS for each task and identifies major milestones for each. A project-level Gantt chart for the six tasks is also found in Annex B.

A top-level schedule allows the readers to orient themselves to the need to tie surveillance activities and project milestones together.

4.0 Surveillance Program Objectives

The objective of the surveillance program is to provide accurate processed information for the IO3 project staff to assess the AJX Team's quality of performance in executing the contract and to manage overall project risk to acceptable levels.

The IO3 project will also serve as an additional source of information for use in enhancing the NASA-wide approach to insight-focused surveillance planning. After the project team has successfully orbited the platform around Io and survey has begun, the IO3 Project Manager will provide a formal report to the NASA administrator on the outcome of the issue-based approach to contact performance surveillance. This report, after approval, will be provided to all Project Managers and directorate heads for their personal action.

If there are secondary, broad-area objectives that are not specifically identified with this project, identify these here.

Specific the surveillance program goals include the following:

- **Manage project risk using risk factor monitoring metrics and directed attention**
- **Assure that off-the-shelf technology is fully qualified for space operations**
- **Complete design, build, launch of the IO3 platform within 30 months of contract award while operating in a safe and environmentally responsible manner.***
- **Maintain worker safety record of <.89 accidents per 100,000 hours**
- **Reduce contractor-to-Government surveillance reporting actions to 18 per week from 108 per week**
- **Identify set of key metrics (25 or less) to monitor project progress and assess risk status for specific past problem/issue areas**
- **Maintain a Government-worker to contract-quality-assurance-worker ratio of 1:4 or less**
- **Monitor mission effectiveness while collecting data on in-operation faults after launch to build a baseline for future performance-based contract metrics**

Whenever possible, use actionable, measurable objectives.

This surveillance plan provides the conceptual framework to conduct project surveillance for the IO3 project, to identify sce areas of focus, to specify the critical measures and acceptable control limits for performance, and to identify speificsurveillance activities and assign responsibility for their completion.

Describe what this plan will do for effective management of the project. Identify specific objectives that the PM and staff have identified.

* **Contract incentive program is tied to completion in 24 months**

5.0 NASA Strategy and Approach

NASA's project management approach is to conduct an insight-based surveillance of ongoing design, fabrication, integration, and launch preparation activities focused on controlling project risk while meeting overall project objectives. Two complementary surveillance strategies will be followed: 1) assure general project progress through planned, non-intrusive evaluation of the contractor's progress using agreed-to activities and metrics and 2) conduct focused activities to reduce specifically identified technology and integration risks. The intent of this surveillance is twofold: to provide public confidence in NASA's capability to successfully execute this type of future mission and to provide the agency with assurance of mission success.

The monitoring of project progress provides confidence that the project will succeed because the processes are correct; risk resolution strategy actively mitigates known problem areas while maintaining a constant view on other ongoing, critical issues. NASA will provide access to technical information, proven processes, and specific technical expertise as requested by the contractor team, but will not provide continuous monitoring or conduct any more than periodic inspection of prime contractor fabrication activities. The IO3 project office, after Critical Design Review approval of the mission equipment and launch plans, will focus its surveillance activity toward working cooperatively to mitigate areas of high potential project risk while continuing insight monitoring of project progress. NASA will actively direct the actual launch operation to assure public safety and to allow mission controllers to immediately assume full control after launch.

<u>Definition</u>
Strategy - a careful plan of method that serves an important function in achieving success.

The project surveillance strategy(ies) should identify broad approaches to assuring project success in an environment constrained resources.

Identify if possible why this strategy is used.

5.1 Key Strategy 1: Insight Monitoring of Project Progress

In conducting insight monitoring of the project's progress, the Project Manager will maintain an independent assessment capability of assessing overall project progress. Although much of the data used to make this assessment will be drawn from contractor-provided sources, the results of IV&V, audit and inspection results, and subjective reports by the PM staff may provide valuable insights.

The strategy requires constrained data collection and focused surveillance activities.

In addition, NASA will continue to monitor a core set of activities that are critical to task completion, but are generally well managed and have a high potential for success without Government monitoring or intervention. As such, the agency has identified a set of approaches that will be used to establish monitoring activities, to identify metrics, to establish control limits on these metrics, and to prescribe management activity should performance fall outside tolerances.

5.2 Key Strategy 2: Focused Risk Management

The IO3 Project Manager will focus management attention on areas with the greatest risk to successful project completion. Risk areas are defined in terms of the combination of probability of adverse outcome and impact on project objectives if the adverse outcome occurs. High-risk items are those with moderate or greater certainty of occurrence (60 percent or greater) and are generally adverse to significant outcome (>15 percent budget growth, notable threat to public safety, >15 percent mission degradation. Identification and rank ordering of these specific issues in terms of probability of outcome and cost impact provide a tangible means of measuring initial risk and focusing attention on what is important. NASA's intent is to continuously assess the relative risk of each area on a quarterly basis and adjust

Consider the use of focused risk management as a component of any significant PBC activity. It is a high payoff activity used by the more successful civil terms.

surveillance activities to reflect changes.

5.3 Approach to Executing the Strategies

The IO3 Project Manager has identified key strategies of risk reduction and limited oversight for prime contractor surveillance during the project based on insights provided by prior risk analysis and common sound business practice. The insight surveillance strategy approach identifies what NASA will do to assure overall successful completion of the contract using a top-level perspective. The issue-related strategies approach shows what the IO3 project office will do to reduce project risk from the bottom up. The general approach emphasizes the role of NASA in gaining and maintaining overall project insight; the issue approach emphasizes the Project Manager's direct evaluation of and potential involvement with specific risk-contributing contractor activities. Taken together, these approaches provide the Project Manager with a comprehensive, yet non-intrusive means of assessing contractor's progress toward meeting project objectives while minimizing risk of failure in execution.

Introductory remarks can provide a tone for description of the approach.

5.4 Insight Surveillance Approach

The IO3 Project Manager requires the ability to assess the overall status of the project without intrusive monitoring of the contractor's actions. Beginning with the completion of final contract negotiation, NASA will require open, automated access to information held in the AMX Team IO3 Project information system. NASA will be responsible for the processing, analysis, and interpretation of key metrics to accomplish the following general surveillance strategies:

Call out specific elements of the approach (e.g., passive monitoring, active reporting, inspections, random evaluation, process review, etc.).

- **Monitor progress of contractor's IO3 Project WBS completion**
  - **Conduct scheduled IPRs**

- Use electronic link to contractor's status tracking tool
- Chart milestone progress using graphic tool
- Ask questions when problems or issues arise

- **Monitor design growth/platform design implementation and flight qualification**
  - Develop metrics for critical design parameters
  - Monitor critical design parameters
  - Develop metrics for critical build parameters
  - Monitor critical build parameters
  - Approve for flight when all critical mission parameters are 1 percent under margin
- **Monitor launch vehicle and launch site readiness**
  - Monitor progress of Lower Stage preparation against schedule and WBS activities
  - Monitor progress of Upper Stage preparation
  - Periodically review launch site availability and preparation by NASA for launch activities
- **Monitor project spend and incentive award payments (Government)**
  - Monitor incentive award amount awarded
  - Monitor project progress payments against work completion
- **Monitor schedule milestones and deliverable completion**
  - Note slippage of critical path activities
  - Note reject notices/rework requests on deliverables

Other project monitoring items may be recommended; however, the project team anticipates being able to reduce recurring metric reporting to the Government. In its place, NASA will make project data access a condition of its continuing contract.

5.5 Focused Risk Management Approach

The IO3 Project Manager will conduct focused activities to mitigate and otherwise reduce the magnitude of known high-risk areas of the project. As with the general project, at the time of final contract negotiation, NASA will require open, automated access to specific information held in the AMX Team IO3 Project information system. NASA will be responsible for the processing, analysis, and interpretation of key risk assessment metrics to accomplish the following general surveillance strategies. In addition to this routine monitoring, NASA will conduct a limited set of project surveillance-related activities in concert with the prime contractor to reduce the overall project risk. These activities include the following:

Establish the balance between NASA actions/ involvement in risk reduction and contractor involvement.

- Complete detailed independent analysis of maneuvering fuel system; implement integrated project team to transfer innovative applicable technologies to the AMX design team
- Test the computer through a full-load platform demonstration using a single computer unit assuring 90 percent of full-up system capability
- Monitor Software Integration Program using IV&V Contractor; complete spot requirements traceability assessments on a periodic basis
- Schedule and monitor an Aurora Test for flight hardware for prompt radiation effects
- Conduct periodic on-floor Spot Review of Subcontractor Electronic Component Quality; conduct in-plant quality evaluation of proposed subcontractors prior to CDR completion and authorization to proceed

This detail provides direction based on known potential issues. Tailor as needed.

Whenever possible, issue surveillance will be terminated or significantly scaled back when risk mitigation approaches have been effective in reducing the item project risk from the high risk category of interest. New candidates for issue surveillance may be introduced as the project progresses at the discretion of the IO3 Project Manager.

6.0 Surveillance Activities and Schedule

The surveillance activities leading to the successful launch and deployment of the IO3 platform are limited in scope and scale to those that provide insight and increased confidence of mission success to the NASA project office. The activities fall into three basic categories: frequent communication, selected product verification and audit, and assurance reviews. Most of these activities have already been defined in the project statement of work and in the AJX Team proposal.

Basis for effective surveillance usually requires purposeful communications, open demonstration of product performance, and structured review to provide face-to-face interaction between NASA and contractor project staff.

6.1 Insight Surveillance Activities

Table 2 provides a summary of the regular activities designed to provide Project Manager insights into the progress of the IO3 project.

TABLE 2. SUMMARY OF PROJECT MANAGER ACTIVITIES

Surveillance Activity Category	Specific Activity
Communications	• Daily Informal Telecon • Weekly DPRO Summary • Monthly AJX Team IO3 Project Status Report
Product Verification	• Item/Deliverable Inspection • Like Item Testing • Actual Item Testing • Physical Configuration Audit • Functional Configuration Audit • Software Integration IV&V
Assurance Reviews	• Project Status Review • Requirement Reviews • Preliminary Design Review • Critical Design Review • In-process Technical Review • Preflight Readiness Review

As the project matures, the nature of the communication between the AJX Team and the IO3 Project Manager will evolve, reflecting a higher level of mutual trust based on shared experience. Surveillance will take on a more ad hoc nature and yet remain focused on major risk areas as articulated earlier.

6.2 Focused Risk Management Activities

Specific risk management activities have been identified to reduce total project risk. These activities are focused to identify, mitigate, and, if necessary, monitor eradication of root cause situations that contribute to the risk situation. Metrics for measuring the reduction of risk are specified in more detail in Section 7.0 of this plan, “Project Surveillance Metrics and Control Limits.” Specific activities related to major issues and the specific project milestone suspense are summarized in Table 3.

If possible, identify what, who, when, why.

TABLE 3. ACTIVITIES RELATED TO MAJOR ISSUES.

Risk Area	Activity	Complete By
Maneuvering Fuel Supply	Detailed Independent Analysis Of Maneuvering Fuel System By An Integrated Project Team	Completion Of CDR
Lower Stage Launcher Reliability	Conduct NASA/AJX Joint Flight Analysis Of Prior Delta Launch Failures To Discern Patterns/Causality - Eliminate Failure Factors	Initial Flight Readiness Review
Meteoroid Collision	Execute Simulation Study; Identify Potential Material Solutions	CDR Minus 2 Months
Inflight Computer Performance	Perform Full-Load Platform Demonstration On A Single Computer Unit	Prototype Flight Vehicle Readiness Review
Radiation Hardening Of Electronics	Aurora Test Of Prototype Vehicle	CDR + 3 Months
Software Requirements Growth	Continuing IV&V Surveillance	SRR To Flight Readiness Review
Solar Panel Deployment	Chamber Test Flight	PDR + 2 Months Until Confident In Design Reliability
Upper Stage Rocket Design	Static Instrumented Firing Of Prototypes, Flight Vehicle ND Inspection	3 Test Firings, Detailed Pre-Assembly Inspection
Software Requirements Configuration Management	Continuing IV&V Surveillance, Periodic Status Review	SRR To Flight Readiness Review
Package Weight Growth	Periodic Status Review	Until Launch
Power Distribution Bus Loading	Periodic Status Review	Until Launch

7.0 Project Surveillance Metrics and Control Limits

Two types of surveillance metrics are defined in this section: insight surveillance metrics and focused risk management metrics. The first type provides general project health status and includes NASA-required project metrics. The second type is specifically related to the issues identified previously and relates specifically to the risk reduction of these issues. Taken together, they provide a balanced, data-enabled view of the project status and vital health signs.

This section describes what NASA will measure specifically in the insight mode. It also calls out specific control limits for adequate performance.

7.1 Risk Issue Metrics

The pareto risk analysis results (found in Annex A) provide a prioritized set of issues for focused surveillance. The prior section identified the specific activities required to reduce risk and provide NASA project managers with the assurance that these high risk issues would be worked most diligently. Table 4 provides the quantitative metrics used to monitor these key issues. Each defined metric describes data source, interpretation, and control limits and describes the anticipated utility of the metric in project management. In some cases, multiple metrics are defined for a single issue to obtain a broader view on issue dynamics.

TABLE 4. QUANTITATIVE METRICS

Issue	Metric	Data Source	Control Limits	Interpretation and Utility
IO3 Project Risk Metrics				
Maneuvering Fuel Supply Leakage	Percent Leakage/ Unit Time (Observed in Chamber Test)	Chamber Test Reports	Single Test: Less Than .02% Per 100 Hours Flight Average Test: Less Than .03% Per 100 Hours Flight	Direct Measurement of System Performance Issue; Allows Direct Assessment of the Progress in Resolving a Continuing Problem
Lower Stage Launcher Reliability	Material Defects Noted; Observed Procedure Deficiency Reports	Contractor QA Reports, DSMC QA Sampling, NASA Independent No-Notice Inspections	Total # Open Defect Reports Less Than 10; Major Deficiency Reports < 4 Per 50 Inspections	Low Defect Rates (Input Material) and Careful Execution of Work Processes Indicate "Sweating The Details"; Results in Higher Probability of Success
Meteoroid Collision Hardening	Calculated (Simulation-Based) Probability of Mission Failure	NASA / AJX Team Design Simulation Tool (FASGEN)	$P_{failure} < .22$ (Random Meteorite Pattern)	Low Failure Rate in a Representative Environment Builds Assurance of a Robust Design (2 Sigma)
Inflight Computer Performance	Mission Operations Available Margin	Contractor Estimates, IV&V Contractor Reports	Margin > 17% of Capacity	Extra Capacity Now Allows for Future Mission Software Growth without Requiring HW Upgrade and Requalification

TABLE 4. QUANTITATIVE METRICS (CONTINUED)

Issue	Metric	Data Source	Control Limits	Interpretation and Utility
IO3 Project Risk Metrics (Concluded)				
Radiation Hardening Of Electronics	Observed Dose Accumulation Failure Graph; Observed Failure Threshold	Aurora Test Reports	< 1 Failure Per 1kcurie Dose; Installed Component Failure Threshold < 250KRAD	Hardening of Microelectronics and Reduction of Coupling Paths Increases Confidence in Ability to Survive Hostile Space Environments; Accumulated Dose Provides Time Based Material Breakdown Characteristic, Peak Load Is for an Impulse-Type Shock Situation
Solar Panel Deployment	Percent Defective Trials; Total Trials	Prime Reports, NASA Informal Reports	< 3% Defective Trials (30 Trials Minimum)	Low Defect Rates Indicate High Reliability of This Key Subsystem
Upper Stage Rocket Design	Test Firing Thrust Generated Per Lb Weight	Test Reports	> 10 Lbs Thrust Per Thruster Lb, (40,000 Lb Required for Earth Escape)	Consistency of Results Provide Better Ability to Calibrate Motor for Mission Needs; Performance Threshold Allows Minimum Level of Performance
Software Requirements Configuration Management	% Design Requirements Implemented in Code Modules; # Undocumented Features Implemented	IV&V Contractor Reports / Data Base	93% of All Requirements; 100% of All Mission Requirements; < 10 Undocumented Features Per 10^6 Lines of Code	Implementation Assures Software Basis for Performance; Low Add-on Rate Assures Tight Configuration and Design Team Discipline
Platform Package Weight	Percent of Booster Capacity	Prime Contractor Data Base	Between 92% and 97%	Focuses on Real Reason We Have a Weight Limit - Booster Capability.

TABLE 4. QUANTITATIVE METRICS (CONCLUDED)

Issue	Metric	Data Source	Control Limits	Interpretation and Utility
IO3 Project Risk Metrics (Concluded)				
Power Distribution Bus	Available (Uncommitted) Bus AMPS	Prime Contractor Data Base	Between 4.5 and 5.0 AMPS	Assures Growth Option for Future Systems and Temperature Management Changes
Subcontractor Electronic Component Quality Assurance	Number of Outstanding Problem Reports	Prime Contractor Data Base; DCMC Reports	Less Than 5 Total Unresolved Reports on File	Apprehends and Eliminates Substandard Components Before Becoming Part of the System (and Subsequent Replacement)
Hardware Configuration Management	Observed Variations of As-Built from As-Designed	PCA Audit	Less Than 10 Per Major Assembly	Provides Ability to Recreate Design and Should Problems Occur, Provide Means of Error Tracking

8.0 Organization and Required Resources for IO3 Project Surveillance Plan Execution

8.1 Surveillance Organization

The IO3 Project office uses a classic “project team” approach in which individuals are detached from staff functions or previously existing product/project teams to become members of a multi-disciplinary project team. There are five permanent staff positions identified for the team: Project Manager; Deputy Project Manager; Project Engineer; S&MA Leader; and Contracting Leader and Administrative Support. Each of these individuals have been identified for leadership due to past experience and demonstrated potential for continued project management growth. An additional ten positions are assigned using staff allocation assignments from established center-

Call out team members and provide rationale for their inclusion. If special detailing or matrix relationships are used, identify “lending” agency responsibilities for support to the project.

level staff directorates. At the completion of the project, these staff allocation individuals will be assigned back to their respective staffs. The six permanent positions will remain with the project until its termination or reassignment. Figure 1 below illustrates the IO3 organization and key functions of each area.

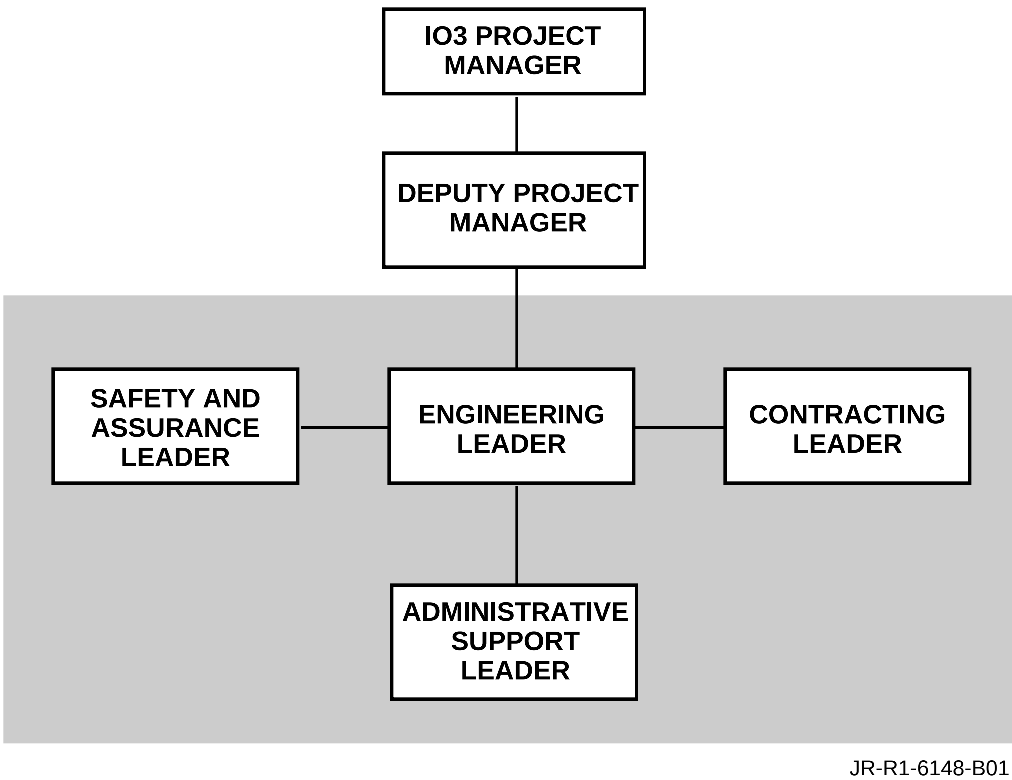

Figure 1. IO3 Project Core Management Structure

Within the IO3 project office, the resolution of issues and coordination with agency entities will be conducted using small issue teams (Integrated Project Team) with specific agenda, timelines, and assigned resources. Responsibility for the collection and analysis of metrics falls to the S&MA staff function. The Administrative Support Leader will provide

assistance in collecting routine information, establishing and updating project schedules, and preparing graphics displays and required performance reports.

8.1.1 Project Manager Responsibilities

The Project Manager must be included as a part of the surveillance organization. Failure to include may result in lack of management commitment to insight surveillance.

The IO3 Project Manager is responsible to the Director for the safe, efficient, and cost-constrained execution of the IO3 project. Continuing surveillance of contractor progress and coordination of agency activity to support and mesh with the contractor's efforts is required. He approves the project surveillance plan and assures its use in the management of the project. He coordinates the PBC elements of the project with Code M and the assigned procurement specialist. The project manager is primarily the NASA "inside man," working internal issues related to agency procedures and policy; however, he or she will remain fully aware of contractor progress and status of major issues. In addition, the PM will take the primary leadership role in coordinating project issues and support needs with other government agencies (OGA).

8.1.2 Deputy Project Manager Responsibilities

The DPM will have a large part in assuring that the project works and that the direction is correct.

The IO3 Deputy Project Manager will assist the project manager by working primarily with the contractor to make certain that AJX-NASA issues are resolved in a timely and effective manner. The focus of this attention is assuring that the right things are getting done on time and that problems relating to NASA support to the contractor for information, for facilities coordination, or for GFE material are resolved. In addition, the Deputy PM will assist the PM in working issues related to OGA support. The Deputy PM is responsible to the PM to have a complete insight into contractor status on all risk issues and overall status.

8.1.3 Safety and Mission Assurance Leader Responsibilities

S&MA participation assures the right issues are monitored. Their high level of corporate insight into past history makes their participation mandatory.

The IO3 Safety and Mission Assurance Leader will direct the combined activities of two supporting staff specialists in reducing overall project risk through coordination and conduct of the specific issue-related activities identified previously. Specifically, the S&MA Leader will lead a coordinated effort to resolve or mitigate quality or producibility risk factors in the IO3 project. Activities may include the following:

- **Special inspections or procedure audits**
- **Participation in contractor quality review**
- **Government ECP review for QA/MA impact**
- **Evaluation of contractor safety project**

Software IV&V contractor monitoring and IV&V results monitoring will be assigned to one staff specialist working for the S&MA leader whose primary focus is software integration and messaging protocols. The Leader will maintain full awareness of this activity and be prepared to present IV&V findings and assessment as needed.

8.1.4 Engineering Leader Responsibilities

Engineering has the power to make things happen. Inclusion assures problems get solved expeditiously.

The IO3 Engineering Leader will direct the combined activities of three supporting staff specialists in reducing overall project risk by conduct the specific issue-related studies and independent engineering assessment activities identified previously. Specifically, the Engieneering Leader will lead a coordinated effort to resolve or mitigate technical performance risk factors in the IO3 project. The Leader will be independently responsible for forming IPTs, monitoring independent NASA and contractor efforts, and gathering metric data that may be used to attain and document progress

in resolving issue areas. Whenever possible, the Engineering Leader will also serve as a conduit to coordinate and resolve potential integration-related problems and bring them immediately to the attention of the DPM. The Engineering Leader will employ the assigned staff specialists to assist in assessing the status of the platform, launcher, upper stage, and launch facility planning and overall operational readiness.

8.1.5 Contracting Leader Responsibilities

The IO3 Contracting Leader supervises three specialists in the conduct of contract management, PBC incentive assessment, and the formal procedural acceptance of deliverable items. The Contracting Leader will coordinate directly with the supporting DCMC office for hardware technical review, physical/functional configuration audits, and acceptance inspections. The Contracting Leader will be responsible for gathering and reporting NASA compulsory metric information, for developing the IO3 Contractor Metric reports, and for coordinating for the open access to contractor-held data for the IO3 project.

Contracts representatives keep the legal side straight and help to maintain cooperative NASA contractor efforts within the scope of the contract

8.1.6 Administrative Support Leader Responsibilities

The IO3 Administrative Support Leader will supervise two specialists in providing technical publication, typographical, and graphics support to the project office; for maintaining project related data bases; and for generating routine management reports. In addition, the Leader will assure the input of schedule information and changes into project data bases. Project labor hour reporting will also fall to this leader.

Admin is a necessary part of a smooth organization. Technical specialists need administrative assistance.

* FY96 constant dollars

9.0 Required Resources

The execution of the surveillance plan is largely handled by the inherent staff of the IO3 project office. The direct labor cost of the project management function is 3 percent of the project total cost or approximately $3.75 million* over the two-year development period. (The entire cost of this item is allocated to the surveillance function after contract award.) In addition to the direct labor expenses of the project office, $720,000 is required for the contracted performance of an 18-month software integration IV&V task. Travel expenses for surveillance-related activities over the two-year performance period are estimated to be $175,000. The resulting total execution resource requirement is $4.645 million or 3.7 percent of the total project development and launch allocation of $125 million.

If possible, call out the budgeted commitment to project surveillance. This is easy if you track resource use with activity-based accounting and control.

ANNEX A

SAMPLE RISK ISSUE CRITICALITY RATING

During bid evaluation the proposal evaluation team identified 27 areas of potential high risk based on the winning contractors initial proposal. Negotiations have reduced this list to 15 areas that require continuing and vigorous project management attention. These 15 areas are shown in table below.

Note: This table is notional and for the purpose of illustration only

	Risk Area	Issues	Probability of Occurrence	Impact if Adverse Outcome Occurs
1.	Subcontractor Electronic Component Quality Assurance	Prior experience with the proposed subcontractor resulted in 6% reject rates	85%	Unqualified flight hardware in design - potential failure in flight
2.	Software Requirements Configuration Management	Requirements creep with undocumented enhancements. Module - requirement traceability	65%	Features implemented without a firm requirement - possible slowdown during operations (may result in embedded virus)
3.	Software Integration Quality Assurance	Integrator member has prior experience in aircraft avionics but very little in space avionics	75%	Delays and rework Cost escalation of 180% normal
4.	Inflight Computer Performance	Double redundant rather than triple redundant processor; lower speed	60%	Reduced Mission reliability margin
5.	Radiation Hardening of Electronics	COT/MOT hardware require enclosure hardening against radiation effects	60%	Degradation of sensors and computers over time; possible mission failure.
6.	Power Distribution Bus	Dual distribution network with single interface to Solar and Batteries	65%	Single Point mission failure mode

	Risk Area	Issues	Probability of Occurrence	Impact if Adverse Outcome Occurs
7.	Solar Panel Deployment	Second use of novel thin film unfolding technology	70%	Insufficient power beyond 18th months from launch
8.	Space Communications Protocol	Subspace noise and messaging protocol resulted in reduced message responsiveness.	65%	Incomplete messaging; possible loss of control
9.	Maneuvering Fuel Supply	Past 2 missions using new XRJ design had fuel leakage of 1.5% per month - 14 month flight time could result in 21% reduction in orbit insertion and station keeping fuel	90%	Failure to insert and or complete on station observation period
10.	Meteoroid Collision	Voyager experienced 37 meteoroid collision in a 18 day transit of asteroid belt. If size of meteoroid is large, system may fail to insert into IO orbit	95%	Failure to reach objective area for observation
11.	Lower Stage Launcher Reliability	Delta rocket reliability decreased from 96% in 198X to 87% in 199X	87%	Failure to achieve any mission goals
12.	Upper Stage Rocket Design	Second use of new ablative nozzle rocket motor	70%	Possible Launch failure
13.	Hardware Configuration Management	LUNA2 Physical Configuration Audit resulted in 20 correctable drawings and material list discrepancies	60%	Unable to successfully replicate exact design for future systems
14.	Package Weight	LUNA 2 had a 8% weight growth prior to launch	65%	Weight Margin for use of low cost Delta (<14,000 lb. w/ rocket)
15.	Funding Instability for Progress Payments	Annual funding for Deep space exploration reduction of 60% due to debate within House	70%	Project stretch-out or cancellation

Impact Ranked Project Risk Issues

Analysis of the risk issues using a modified cost-risk analysis ranks the issues in the following order of importance.

Note: This table is notional and for the purpose of illustration only

Relative Risk Importance	Risk Area	Probability of Occurrence	Cost to Correct or Test (% of Total Project)	Relative Cost Impact Factor
1.	Maneuvering Fuel Supply	90%	30%	.27
2.	Lower Stage Launcher Reliability	87%	30%	.261
3.	Meteoroid Collision	95%	20%	.19
4.	Inflight Computer Performance	60%	30%	.18
5.	Radiation Hardening of Electronics	60%	20%	.12
6.	Software Integration Quality Assurance	75%	15%	.1125
7.	Solar Panel Deployment	70%	15%	.105
8.	Upper Stage Rocket Design	70%	10%	.07
9.	Software Requirements Configuration Management	65%	8%	.052
10.	Package Weight	65%	8%	.052
11.	Power Distribution Bus	65%	5%	.0325
12.	Space Communications Protocol	65%	5%	.0325
13.	Subcontractor Electronic Component Quality Assurance	85%	3%	.0255
14.	Hardware Configuration Management	60%	2%	.012

Note: Project stretch out and funding loss, although a project related risk, are political issues with limited correlation to other project risk areas under the control of the project manager. We have limited our surveillance strategy of the AJX team to only consider only items under the control of the team. Political funding will not be considered as a direct surveillance item; however, it remains a priority for the project manager.

ANNEX B
INSIGHT SURVEILLANCE METRICS

NASA Policy requires the reporting of specific project status metrics as part of their overall project management procedures. These statistics will be supplemented by additional, project-focused metrics to provide the Project Manager and staff honest assessment of the project status. Table B-1 displays a general project metrics for the IO3 project.

When a metric exceeds the control limit, the Project Manager/Deputy Project Manager will lead a joint contractor-NASA team to identify the root cause and enter the causal item into the risk issue management program for a period of not less than 120 days. The resulting process will be managed by NASA and the AJX team jointly to reduce project risk using the metrics management process.

If there are mandatory metrics required by policy, directive guidance, or regulation, identify their source explicitly. All others are considered as products of your creativity. Detail shown here is representative of what should be included in any plan (or plan appendix).

TABLE B-1. PROJECT METRICS FOR THE IO3 PROJECT

Metric	Displays	When	Comment	Control Limit
Mandatory NHB 2340.4a Metrics				
Actual Cost Deviation From Contractor's Cost Plan	Forms 533 M/Q/P Data	Quarterly	Mandatory; Measures Ability to Forecast Work Hours	None
Cost Performance Index	Nasa Budgeted Cost of Work/ Contractor's Actual Cost of Work	Quarterly	Mandatory; Measures Ability to Forecast Required Labor Mix	Less Than .95
Cost to Complete Trend Analysis	By Quarter Estimate of Cost to Complete	Quarterly	Mandatory; Illustrates Project Cost Growth Only	None

TABLE B-1. PROJECT METRICS FOR THE IO3 PROJECT (CONTINUED)

Metric	Displays	When	Comment	Control Limit
Mandatory NHB 2340.4a Metrics (Continued)				
Schedule Timeliness	Percent of Scheduled Milestones on Time	Quarterly	Mandatory; Does Not Consider Critical Paths	Subjective by PM
Schedule Performance Index	Form 533 P Data; Budgeted Cost of Work Performed (BCWP)/ Budgeted Cost of Work Scheduled (BCWS)	Quarterly	Mandatory; <1 Indicates Behind Schedule, >1 Ahead of Schedule (Reflects Spend Plan Only; Does Not Reflect Actual Work Completed)	Subjective by PM
Schedule Variance	{(BCWP-BCWS)/BCWS}X Days Since Last Baseline	Quarterly	Mandatory; >0 Implies Ahead of Schedule	None
Time to Complete Trend Analysis	By Quarter Estimate of Time to Complete	Quarterly	Mandatory; Illustrates Project Schedule Modifications Only	Subjective by PM
Technical Metric	Anything that the PM Wants Sent up to HQ for Review	Quarterly	Mandatory (At least 1 but not more than 2)	Subjective by PM
Safety and Mission Assurance	Anything that the PM Wants Sent up to HQ for Review	Semi-annually	Mandatory; Should Show a Positive Trend of Correcting Problems	Subjective by PM
Award Fee	Percent of Award Fee Paid	Semi-annually	Mandatory; May Also Explain Significant Strengths or Weaknesses from Award Fee Report	Less than 70% Awarded
Subcontracting Plan Metric (Socioeconomic)	Percent of Funded Prime Work Awarded to 8a and SDB Enterprises	Semi-annually	Mandatory; Must Show Planned Amount as Well as Actual Amounts	Not Meeting Participation Goal

TABLE B-1. PROJECT METRICS FOR THE IO3 PROJECT (CONCLUDED)

Metric	Displays	When	Comment	Control Limit
Mandatory NHM 2340.4a Metrics (Concluded)				
Color Coded Summary	Compilation of All Metric Charts	Semi-annually	Mandatory; See NHB 2340.4a Page "Example 11"	N/A
IO3 Project Specific Metrics				
Project Risk Index	Project Risk Rating	Monthly	IO3 Project Only; Report from Risk Tracking Tool	Risk Growth of 3% from Past Report
Top 10 Risks Status	Current Issue Risk Rating Metric; Last 4 Periods Issue Average Rating	Monthly	IO3 Project Only; Rating and Brief Issue Summary; from Risk Tracking Tool	No Control Limit
Budget/Work Status	Percent Work Completed/Percent of Task Funding Invoiced	Monthly	IO3 Project Only; Uses Contractor Data for Completion, IO3 Data for Invoices	.9 or Less
IV&V Open Class 1 Discrepancies	Number of Currently Unanswered	Monthly	IO3 Project Only	Inventory Growth of 3% or More
Contractor OSHA Reportable Mishaps	Mishaps Per 10,000 Labor Hours	Monthly	IO3 Project Only	Any Increase
Critical Path Days to Complete (By Task)	Number of Days to Complete, Last 10 Periods Numbers	Twice Monthly	IO3 Project Only; Uses Contractor Data for Completion	Rate of Increase Above .03; Single Point Increase of 3% of Remaining Days or More